

Software Requirements Specification

1. Data Bank Shuttle Automated Function Executive (DBSAFE)

1.1 DBSAFE Introduction

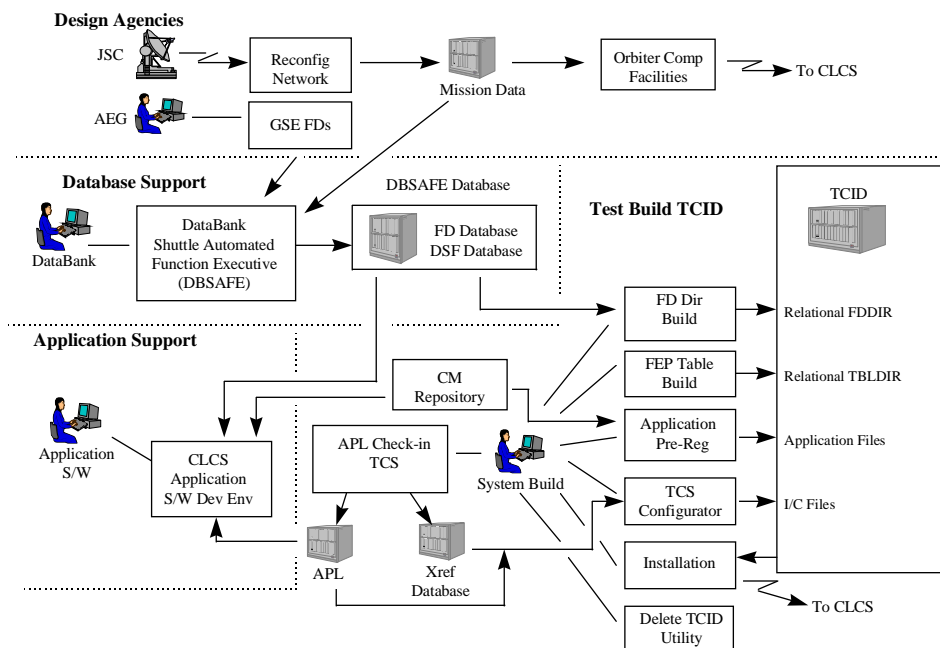
1.1.1 DBSAFE Overview

DBSAFE is a comprehensive Checkout and Launch Control System (CLCS) software capability that provides an interactive user interface supporting the evaluation, incorporation, and historical tracking of engineering changes to the FD Database. DBSAFE for CLCS is ported code baselined from the DBSAFE software developed for the replatform of CCMS Support Software to the Shuttle Data Center (SDC).

The core purpose of the DBSAFE is to provide the capability to maintain the FD Database. The FD Database is the portion of the DBSAFE database that contains the information on the measurements, commands, and system parameters needed for CLCS. The attributes of measurements and commands for the orbiters, payloads, ground support equipment, etc., are collected from the various design agencies, processed into a format that is compatible with CLCS, and stored in the FD Database using DBSAFE software. The data is then available to support the CLCS Application S/W Development Environment and Test Build processes.

DBSAFE also provides the capability to create and maintain TCID build specifications for the FD Directory Build process. DBSAFE validates and stores user specifications in the DBSAFE database. DBSAFE facilitates the generation of TCID specifications by automating the following functions:

- Assignment and traceability of Vehicle Configuration Names (VCN) and formats to Test Configuration Identifiers (TCID) based on a list of engineering provided by Ground Software Integration (GSI)
- Assignment of projected VCNs and formats to TCIDs based on matching each mission/TCID configuration to the effectivities of engineering changes in the FD Database
- Assignment and traceability of format revisions to each mission/TCID based on the format engineering defined in the Shuttle Data Tape (SDT)
- Support elimination of invalid/duplicate/overlapping addressing in the FD Database, that would otherwise cause errors in a TCID build



Software Requirements Specification

1.1.2 DBSAFE Operational Description

Surrounding the core capability of maintaining the FD Database, DBSAFE consolidates (into a single user interface) functions for evaluating, implementing, and tracking the history of engineering changes in the FD Database. These highly integrated management services consist of the following major functional areas:

- WAD/Tracker - supports creation and maintenance of the change authority and effectivities associated with each set of FD changes.
- * Evaluate Engineering - supports evaluation of data originating from the Master Measurements Data Base (MMDB) at Johnson Space Center (JSC).
- Implement - provides the core FD maintenance capability and supports the review and approval cycle for all changes to the FD Database.
- * MFSDT - supports conversion of MMDB data provided by JSC into the format required for inclusion into the FD Database.
- Baseline - supports consolidation of database records associated with several different engineering changes after the engineering is known to be effective for all future use of the affected FDs.
- TCID - facilitates generation of TCID Build specifications for extracting the subset of FD Database data applicable to a particular system checkout or shuttle mission.
- Cleanup - provides reports of database sizing parameters and identifies obsolete data to aid in maintaining acceptable performance levels within the DBSAFE database.
- DBSAFE Control - provides administrative functions for maintenance of data in certain DBSAFE validation tables and for definition of user permissions.

* Delivered but not used in Redstone.

DBSAFE software executes primarily on the LPS Software Development Network (LSDN) of Hewlett-Packard UNIX workstations. The DBSAFE menus and all user interface applications are written using Oracle*Forms. All reports are initiated from Oracle*Forms based applications accessed from the DBSAFE menu. The reports are written in Oracle*Report and are generated as background processes running on the LSDN workstation.

The DBSAFE main menu is initiated through the Relational Software Interface (RSI) system resident on the LSDN. RSI is one of several configuration management tools and techniques designed to fulfill the access control and data integrity requirements of CLCS applications. RSI also satisfies the Ad Hoc Query requirements for DBSAFE by providing read-only access to the DBSAFE database via either Oracle SQL*Plus or Oracle Browser.

All DBSAFE data is stored in an Oracle database located on a Digital UNIX server within the SDC. Data supporting the DBSAFE management services is located in the same physical database as the FD Database; the term "DBSAFE database" encompasses both. The distinction is important because DBSAFE supports a much higher degree of configuration management and control over the data within the FD Database. DBSAFE uses stored database procedures and triggers to satisfy many processing requirements. Communication between the software running on the LSDN and the database in the SDC is handled by Oracle SQL*Net.

Software Requirements Specification

1.2 DBSAFE Specifications

1.2.1 DBSAFE Groundrules.

The following groundrules and assumptions apply to the DBSAFE CSCI:

- Only GSE data will be utilized in DBSAFE for Redstone.
- For Redstone, DBSAFE will not provide an interface to the FD Database for the Data Fusion Editor.
- For Redstone, DBSAFE will not provide an interface to the FD Database for an "early registration" check of the FDs used by user applications.
- DBSAFE forms-based applications are written in Oracle*Forms version 4.0. There are no plans to upgrade to version 4.5 which is now available. The upgrade to version 5.0, projected for release later this year, may be assessed if time permits, but will not be implemented in the Redstone release.

The following are post-Redstone capabilities that may be implemented in the DBSAFE Redstone release, ONLY if there is sufficient time remaining after everything else is completed. Although these capabilities may be available in DBSAFE, it is NOT the plan for them to be supported by the Test Build and Control CSCI.

- Implement support for an 'Enumerated' Data Type
 - This will be similar to a digital pattern with an identified enumerated class (like a state class, but with more than 2 values); also applies to pseudo FDs
- Implement a 'persistence indicator' that is associated with pseudo FDs

1.2.2 DBSAFE Functional Requirements

Entity definitions, functional requirements, user interfaces, and report specifications are ported from the current DBSAFE requirements developed for the replatform of CCMS Support Software to the SDC.

Refer to document 84K00501 "CLCS DBSAFE Software Requirements and Design" for detailed requirements specifications. This document is the DBSAFE CLCS baseline and is accessible through the Web at the following address:

<http://lpsweb.ksc.nasa.gov/CLCS/sei/cscis/csci-dsf.html>

The following are the Redstone requirements. They have been incorporated in the above document.

- The actual_sample_rate field for GSE discrete measurements will be deleted. (retain the design agency sample_rate).
- An indicator to identify HIMS with a Local Process Controller (LPC) will be added.
- Support for Data Fusion Function Designators will be provided:
 - Treat Fusion as a new data source in DBSAFE
 - Support all current measurement type/subtype combinations for Fusion data
 - Only support compiler and hardware data for Fusion data. (no addressing)
- Gateway processing will be driven by a 'link indicator' rather than Gateway names.

Software Requirements Specification

- User maintenance of Gateway definitions that use currently supported link indicators will be supported. (i.e., a new GSE Gateway can be defined by the end-user).
- The times-2-to-the-buffer-length factor in the calculation of M-scaling will be removed.
- User specifications for mapping each FD Database Responsible System (RSYS), applicable to a TCID, to a TCID RSYS to support FD Directory Build will be validated and stored.
- Support for “build groupings” used to support FD Directory Build will be removed - Test Build no longer requires this capability.
 - Remove all columns and references to build groups from DBSAFE.

Software Requirements Specification

- The following columns and references to the following columns will be removed:
 - GLOBAL_CMD_FLAG
 - CDBFR_START_BIT
 - ACTUAL_SAMPLE_RATE (for GSE discrete measurements)
 - SLOPE_1,
 - OFFSET_1,
 - START_COUNTS_2,
 - SLOPE_2,
 - OFFSET_2,
 - START_COUNTS_3,
 - SLOPE_3,
 - OFFSET_3,
 - START_COUNTS_4,
 - SLOPE_4,
 - OFFSET_4
 - COMMIT_CRITERIA_IND
 - LOG_CRITERIA
 - EMON_PAGE
 - SYSTEM_LOW_LIMIT
 - SYSTEM_HIGH_LIMIT
 - GOAL_LOW_LIMIT
 - GOAL_HIGH_LIMIT
 - CDS_LOW_LIMIT
 - CDS_HIGH_LIMIT
 - SYSTEM_LOW_FLAG
 - SYSTEM_HIGH_FLAG
 - GOAL_LOW_FLAG
 - GOAL_HIGH_FLAG
 - SIG_CHANGE_VAL
 - CDS_COMPRESS_VAL
 - FP_LIMIT_FLAG
 - SYS_EM_COMPARE_COND
 - SYS_EM_COMPARE_VAL
 - GOAL_EM_COMPARE_COND
 - GOAL_EM_COMPARE_VAL
 - CDS_EM_COMPARE_COND
 - CDS_EM_COMPARE_VAL
 - SYS_EM_STATE
 - GOAL_EM_STATE
 - CDS_EM_STATE
 - REMOTE_COMM_IND
 - LINK
- The following columns will be removed from the common compiler data, but retained in 'legal tables' to support the TCS compiler interface:
 - TYPE_NUMBER
 - SUBTYPE_NUMBER
 - UNIT_NUMBER
 - STATE_CLASS_NUMBER

Software Requirements Specification

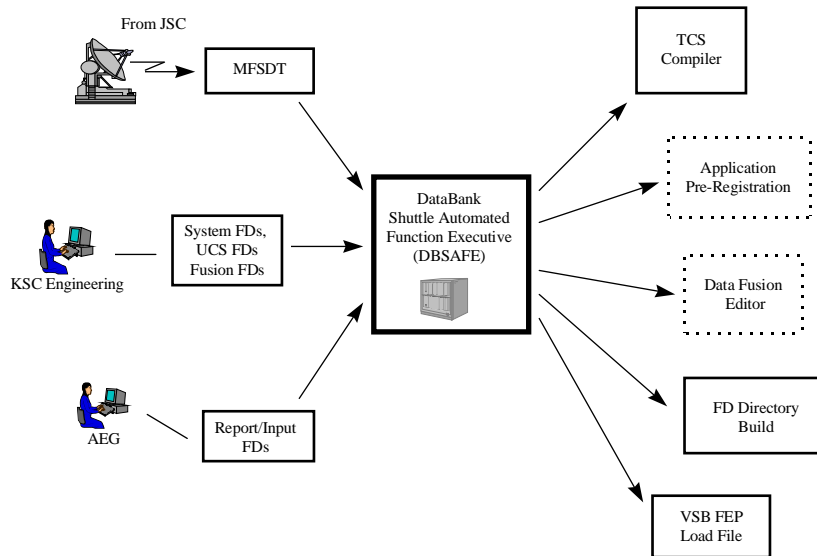
- The following columns and references to the following columns will be modified:
 - Rename FEP to GATEWAY
 - Rename CDBFR_LENGTH to CONVERTED_LENGTH
 - Retain the algorithm for assigning the values.
 - Rename VALID_CDBFR_LENGTH to VALID_CONVERTED_LENGTH
 - Rename CDBFR_RESIDENT_IND to DATA_DIST_SRC
 - Retain the values that are stored in a look-up table and used to drive certain software tests.
 - Retain the software tests.
- The following views will be removed. (they only supported SDC TCID Data Bank Build which creates an emulated IDS-I Data Bank):
 - COMPILER_DATA
 - SEGMENT_DATA
 - AM_HARDWARE_DATA
 - AS_HARDWARE_DATA
 - BTU_HARDWARE_DATA
 - DPM_HARDWARE_DATA
 - DPS_HARDWARE_DATA
 - DM_HARDWARE_DATA
 - DS_HARDWARE_DATA
 - PS_HARDWARE_DATA
 - SSA_HARDWARE_DATA
 - LINK_DATA
 - TCIDDB_FORMATS
 - TCIDDB_VCNS

1.2.3 DBSAFE Performance Requirements

There are no specific performance requirements for DBSAFE.

Software Requirements Specification

1.2.4 DBSAFE Interfaces Data Flow Diagrams



The FD Database is a central repository for storing the attributes of all the measurements, commands, and system parameters needed to support hardware tests and shuttle missions. Data is supplied by several design agencies; among them are:

- JSC - Orbiter and payload data originates from the MMDB at JSC and must be converted into a format that is compatible with CLCS. JSC engineering first comes to KSC in the form of change paper, such as a Shuttle Software/Data Change Requests (DCR). DBSAFE provides tools to evaluate and incorporate these engineering changes into the FD Database via interactive processing. As the launch date approaches, JSC sends KSC a Multi-File Shuttle Data Tape (MFSDT) containing the MMDB data applicable to a particular shuttle mission. DBSAFE provides the capability to compare the data on the MFSDT to the associated data in the FD Database and create a delta report and/or update directives necessary to make the FD Database match the MFSDT data. These update directives facilitate interactive processing of the MFSDT data into the FD Database.
- AEG - The Automated Engineering Generator (AEG) software/database system is the source of information for GSE data. AEG is capable of providing reports listing CLCS compatible FD information. DBSAFE provides the capability to accept data from these reports as input to facilitate interactive processing of AEG data into the FD Database.

Software Requirements Specification

- KSC - Data Fusion FDs, System FDs, and FDs supporting the Utilities Control System (UCS) are examples of KSC engineering data. DBSAFE provides the capability to interactively process these FD specifications into the FD Database.

The FD Database is the source of all FD information supporting the CLCS system. The Compiler for Test Control Supervisor (TCS) applications access the FD Database to obtain compiler information about the FDs used by those procedures. The Fusion Editor may require access the FD Database to verify that Fusion FDs exist and are compatible with their definition in Fusion algorithms. A similar interface may also be required for other functions of the CLCS Development Environment to perform an "early registration" check of the FDs used by user applications.

DBSAFE also supports the FD Directory Build process of Test Build and Control. Automated processes facilitate creation of TCID Build specifications based on a specified list of engineering or based on matching engineering effectivities to a specified TCID configuration. These TCID build specifications are used by the FD Directory Build process to select, from the FD Database, the exact subset of data applicable to a particular test or shuttle mission.

DBSAFE also supports creation of the data file used to load the VSB FEP with Biomed and Safing DECOM addressing. The list of Biomed and Safing measurements and formats are maintained using DBSAFE software. DBSAFE processes these lists against a specified MFSDT to create a VSB FEP Load File report that is copied to a floppy disk and used to load the VSB FEP for a specific mission.